REMARKS

Claims 10-11 are presently pending in the application.

Claims 1-9 have been canceled. New claim 10 includes subject matter from canceled claims 5 and 6, and claim 11 incorporates subject matter from claim 2. No new matter has been added by these amendments, and entry is respectfully requested.

In the Office Action, the Examiner has again rejected claims 1-9 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,617,286 of Sato ("Sato"). Further, claims 1-9 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,121,209 of Watts et al. ("Watts") in combination with a literature reference to Smalheer et al. ("Smallheer"). Finally, claims 1-9 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,443,744 of Bloch et al. ("Bloch") in view of Smalheer. Applicant respectfully traverses these rejections and the arguments in support thereof for the reasons set forth previously on the record, which Applicant relies upon in full, and for the additional reasons which follow, and respectfully requests reconsideration and withdrawal of the rejections.

The Presently Claimed Invention

As previously explained on the record, the purpose of the presently claimed invention is to provide a lubricating oil composition for automatic transmissions which is capable of sustaining excellent μ-V characteristics that are always maintained in a positive gradient, even after the composition has been used in a belt-type CVT (continuously variable transmission) for an automobile for a long period of time. Such a positive gradient will prevent the occurrence of scratch noises.

Previously, it was found that in automobiles having belt type CVTs, the CVTs made scratch noises due to a fluctuation in the rotation of the driven pulley when starting the automobile. Such a fluctuation occurs when the change in the friction coefficient (μ) between the belt and the element over the change in the slipping velocity (V), i.e. the μ-V characteristic, is in a negative gradient. Conventional automatic transmission fluids did not always exhibit

excellent μ-V characteristics in belt-type CVTs, particularly when they were used for long periods of time. Accordingly, the change in the μ-V characteristic became larger and the scratch noises occurred more frequently.

Applicant has discovered that these problems may be solved by adjusting the mass ratios of specific elements, such as phosphorus, calcium, boron, and sulfur, which are contained in a lubricating oil composition, by maintaining specific concentrations of phosphorus, sulfur derived from a base oil, and sulfur derived from sulfur-based additives, and by including specific sulfur-based additives in the lubricating oil composition.

The advantages of the presently claimed composition are shown in Tables 1 to 4 of the present application. Specifically, it can be seen that the inventive compositions prepared in Examples 1 to 6 exhibited positive gradient μ-V characteristics, whereas all of the compositions described in Comparative Examples 1 to 7 exhibited negative gradient μ-V characteristics. Further, comparing Example 1 with Comparative Examples 6 and 7 in Table 4, the claimed composition maintained good positive gradient μ-V characteristics even after it had been deteriorated by oxidation, thus corresponding to an oil which had been used for a long period of time.

Rejection Under § 103(a) Based on Sato

Regarding claims 1-9, the Examiner maintains that Sato teaches a lubricating oil composition for continuously variable transmissions which comprises a lubricating base oil (mineral oil and/or synthetic oil) formulated with: (A) a wear preventative, (B) a metal detergent, and (C) an ashless dispersant. The wear preventative is allegedly a phosphorus-based additive present in an amount to provide a range of 200-500 ppm (0.02 to 0.05 wt%) as phosphorus based on the total weight of the composition. The Examiner argues that the metal detergent may be a calcium salt to provide a range of 100-1000 ppm (0.01 to 0.1 wt%) as metal content, and that the ashless dispersant may be a borated succinimide with a boron content of 0.1 to 5 wt %. The Examiner notes that Sato allows for the addition of other additive components to the composition, including benzotriazole and thiadiazole metal deactivators in amounts of 0.001 to 3 wt%. Finally, the Examiner takes the position that although the mass ratios of

phosphorus:calcium:boron:sulfur are not specifically set forth in Sato, the amounts set forth in compounds containing these elements would result in lubricant compositions which meet the claimed ratios.

In response to Applicant's previous argument that Sato does not teach or suggest the claimed mass ratio of sulfur to phosphorus or the claimed sulfur content, the Examiner argues that the disclosure of Sato is not limited to the examples but to what is fairly taught to one skilled in the art. The Examiner takes the position that since Sato teaches that the mineral oil may contain different oils and since it is well known that mineral oils contain an amount of sulfur, a wide range of sulfur contents for the base oil component, including the claimed range, is disclosed by Sato. Applicant respectfully traverses this rejection as follows.

As previously described on the record, Sato discloses a lubricating oil composition for CVTs which contains an ashless dispersant consisting of a succininmide having boron at a rate of one or more atoms per molecule of the ashless dispersant. The Sato composition is taught to provide a high friction coefficient and to maintain enhanced oxidation stability for a long period of time. However, the invention of Sato is not designed to provide excellent μ-V characteristics so as to always be maintained in a positive gradient in belt type CVTs to prevent the occurrence of scratch noises even after being used for a long period or time. Since Sato does not acknowledge the need to maintain excellent μ-V characteristics or a positive gradient thereof, there would have been no motivation to adjust the parameters (such as sulfur content) which are necessary to obtain such results.

Further, the Sato composition does not contain a sulfur-based additive which is selected from the group consisting of claimed components (B) to (E). Although Sato teaches that other additives may be added to the composition, including benzotriazole, thiadiazole, and derivatives thereof (col. 6, lines 39-44), Sato does not teach or suggest the claimed sulfur-based additives. Accordingly, Sato does not teach or suggest all of the claimed elements, nor would the results exhibited by the presently claimed invention have been expected based on Sato. Accordingly, reconsideration and withdrawal of the § 103(a) rejection based on Sato are respectfully requested.

Rejection Under § 103(a) Based on Watts in view of Smalheer

The Examiner maintains that Watts teaches lubricating oil compositions for use in automatic transmissions which contain a major amount of lubricating oil and minor amounts of: (A) a phosphoric acid-containing compound, and (B) an ashless antioxidant. Watts allegedly teaches that the preferred range of component (A) corresponds to approximately 0.02 to 0.04 mass percent phosphorus in the oil, and also that a source of boron is desirably present in the oil composition, which may be in the form of borated dispersants, borated amines, borated alcohols, borated esters, or alkyl borates. The Examiner contends that Watts also allows for the addition of other additives to the oil compositions, including corrosion inhibitors and detergents, which the Examiner argues are typically disclosed in Smalheer. Suitable corrosion inhibitors allegedly include metal dithiophosphates and metal dithiocarbamates, and suitable detergents include calcium-containing detergents. The Examiner argues that Watts teaches amounts of the various additives in the Table at col. 3, and concludes that the transmission compositions of Watts meet the claimed limitations. Finally, the Examiner takes the position that although the mass ratios of phosphorus:calcium:boron:sulfur are not specifically set forth in Watts, the amounts set forth in compounds containing these elements would result in lubricant compositions which meet the claimed ratio.

In response to Applicant's previous arguments that there would have been no motivation to adjust the composition of Watts to arrive at the claimed parameters, such as sulfur content, the Examiner maintains that Watts allows for the addition of numerous base oils to the composition, and that one skilled in the art knows that mineral oils contain an amount of sulfur. Therefore, the Examiner concludes that a wide range of sulfur contents for the base oil component, including the claimed range, is disclosed by Watts. Applicant respectfully traverses this rejection as follows.

As previously described on the record, Watts teaches a lubricating oil composition comprising a major amount of a lubricating oil and minor amounts of: (A) phosphoric acid and (B) di-nonyl-diphenylamine, which are taught to improve the oxidation stability of the composition. However, the invention of Watts is not designed to provide excellent μ-V characteristics so as to always be maintained in a positive gradient in belt type CVTs to prevent

the occurrence of scratch noises even after being used for a long period or time. Since Watts does not acknowledge the need to maintain excellent μ-V characteristics or a positive gradient thereof, there would have been no motivation to adjust the parameters (such as sulfur content) which are necessary to obtain such results.

Further, Watts does not teach or suggest the claimed sulfur-based additive which is selected from the group consisting of claimed components (B) to (E). Watts teaches that a variety of different additives may be included, such as the corrosion inhibitors taught by Smalheer. Smalheer teaches corrosion inhibitors which include metal dithiophosphates, metal dithiocarbamates, and sulfurized terpenes. However, even the proposed combination of Watts and Smalheer would not teach or suggest the claimed sulfur additives (B) to (E), that is, dithiocarbamates other than metal dithiocarbamates, dithiophosphates other than metal dithiophosphates, trithiophosphites, polysulfides, or derivatives thereof. Accordingly, even the proposed combination of references would not teach or suggest all of the claimed elements. Additionally, there would have been no suggestion based on the proposed combination that the claimed sulfur-based additives would have provided the results exhibited by the presently claimed invention, such as improved μ-V characteristics which prevent scratch noises.

For all of these reasons, reconsideration and withdrawal of the § 103(a) rejection based on Watts in view of Smalheer are respectfully requested.

Rejection Under § 103(a) Based on Bloch in view of Smalheer

Finally, the Examiner maintains that Bloch teaches lubricating oil compositions, suitable as automatic transmission fluids, which contain a base oil and the reaction product of a phosphating agent and a thioalcohol. Bloch allegedly teaches that the reaction product may be added to the base oil in an amount corresponding to approximately 0.02 to 0.04 mass percent phosphorus in the oil. A boron source may allegedly be added, including borated dispersants, borated amines, borated alcohols, borated esters or alkyl borates, such that a molar ratio of boron to the phosphorus in the reaction product is preferably 0.5 to 2.0. Bloch allegedly teaches that the lubricating oil compositions may contain one or more additives, including corrosion inhibitors and detergents which are typically which the Examiner argues are typically disclosed

in Smalheer. Suitable corrosion inhibitors allegedly include metal dithiophosphates and metal dithiocarbamates, and suitable detergents include calcium-containing detergents. The Examiner argues that Bloch teaches amounts of the various additives in the Table at col. 5, and argues that Bloch teaches that the metal in the detergent component is present in the composition in a metal to phosphorus molar ratio (M/P) of 0.005 to 0.5. The Examiner thus concludes that the transmission compositions of Bloch meet the claimed limitations. The Examiner takes the position that although the mass ratios of phosphorus:calcium:boron:sulfur are not specifically set forth in Bloch, the amounts set forth in compounds containing these elements would result in lubricant compositions which meet the claimed ratio.

In response to Applicant's previous argument that Bloch does not teach the claimed concentrations of sulfur derived from a base oil or from a sulfur-based additive, the Examiner maintains that Bloch allows for the addition of numerous base oils to the composition, and that one skilled in the art knows that mineral oils contain an amount of sulfur. Therefore, the Examiner concludes that a wide range of sulfur contents for the base oil component, including the claimed range, is disclosed by Bloch. Applicant respectfully traverses this rejection as follows.

As previously described on the record, Bloch teaches a lubricating oil composition containing a base oil and the reaction product of a phosphating agent and a thioalcohol. Bloch teaches that such an additive is non-aggressive to silicone-based seals, and is also an effective antiwear agent when used in lubricating oils. However, the invention of Bloch is not designed to provide excellent μ-V characteristics so as to always be maintained in a positive gradient in belt type CVTs to prevent the occurrence of scratch noises even after being used for a long period or time. Since Bloch does not acknowledge the need to maintain excellent μ-V characteristics or a positive gradient thereof, there would have been no motivation to adjust the parameters (such as sulfur content) which are necessary to obtain such results.

Further, Bloch does not teach or suggest the claimed sulfur-based additive which is selected from the group consisting of claimed components (B) to (E). Bloch teaches that a variety of different additives may be included, such as the corrosion inhibitors taught by

Smalheer. Smalheer teaches corrosion inhibitors which include metal dithiophosphates, metal dithiocarbamates, and sulfurized terpenes. However, even the proposed combination of Bloch and Smalheer would not teach or suggest the claimed sulfur additives (B) to (E), that is, dithiocarbamates other than metal dithiocarbamates, dithiophosphates other than metal dithiophosphates, trithiophosphites, polysulfides, or derivatives thereof. Accordingly, even the proposed combination of references would not teach or suggest all of the claimed elements. Additionally, there would have been no suggestion based on the proposed combination that the claimed sulfur-based additives would have provided the results exhibited by the presently claimed invention, such as improved μ-V characteristics which prevent scratch noises. For all of these reasons, reconsideration and withdrawal of the § 103(a) rejection based on Bloch in view of Smalheer are respectfully requested.

In view of the preceding Amendments and Remarks, it is respectfully submitted that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,
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